

Leveraging NASA's Digital Transformation to Transform R&M and SMA Activities

RAMS Advisory Panel 2022

PRESENTED BY: Tony DiVenti, NASA R&M Technical Fellow



REACH
—NEW—
HEIGHTS

BENEFIT
—ALL—
HUMANKIND

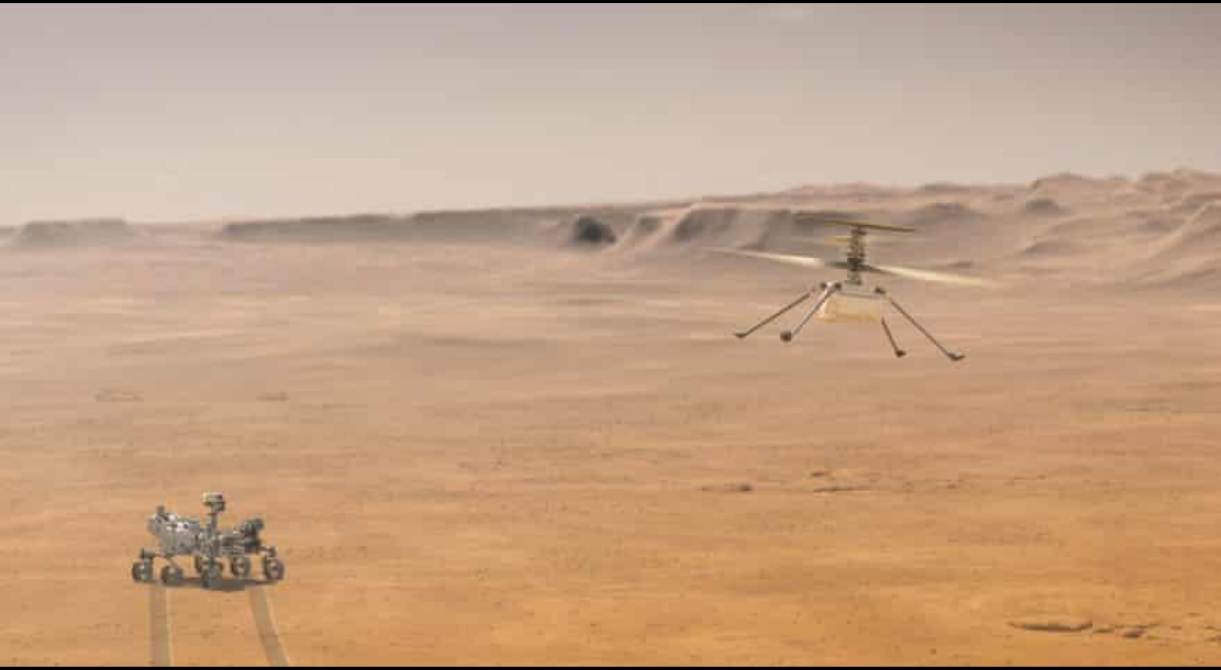
REVEAL
—THE—
UNKNOWN



Then...

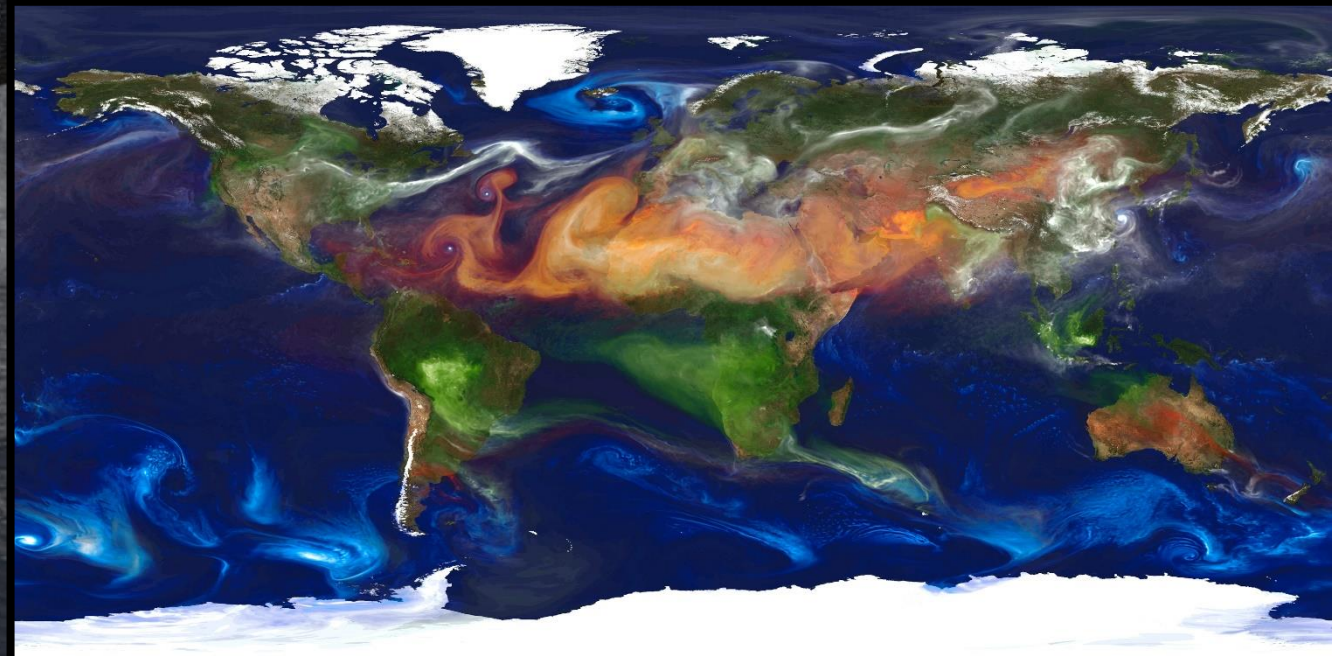
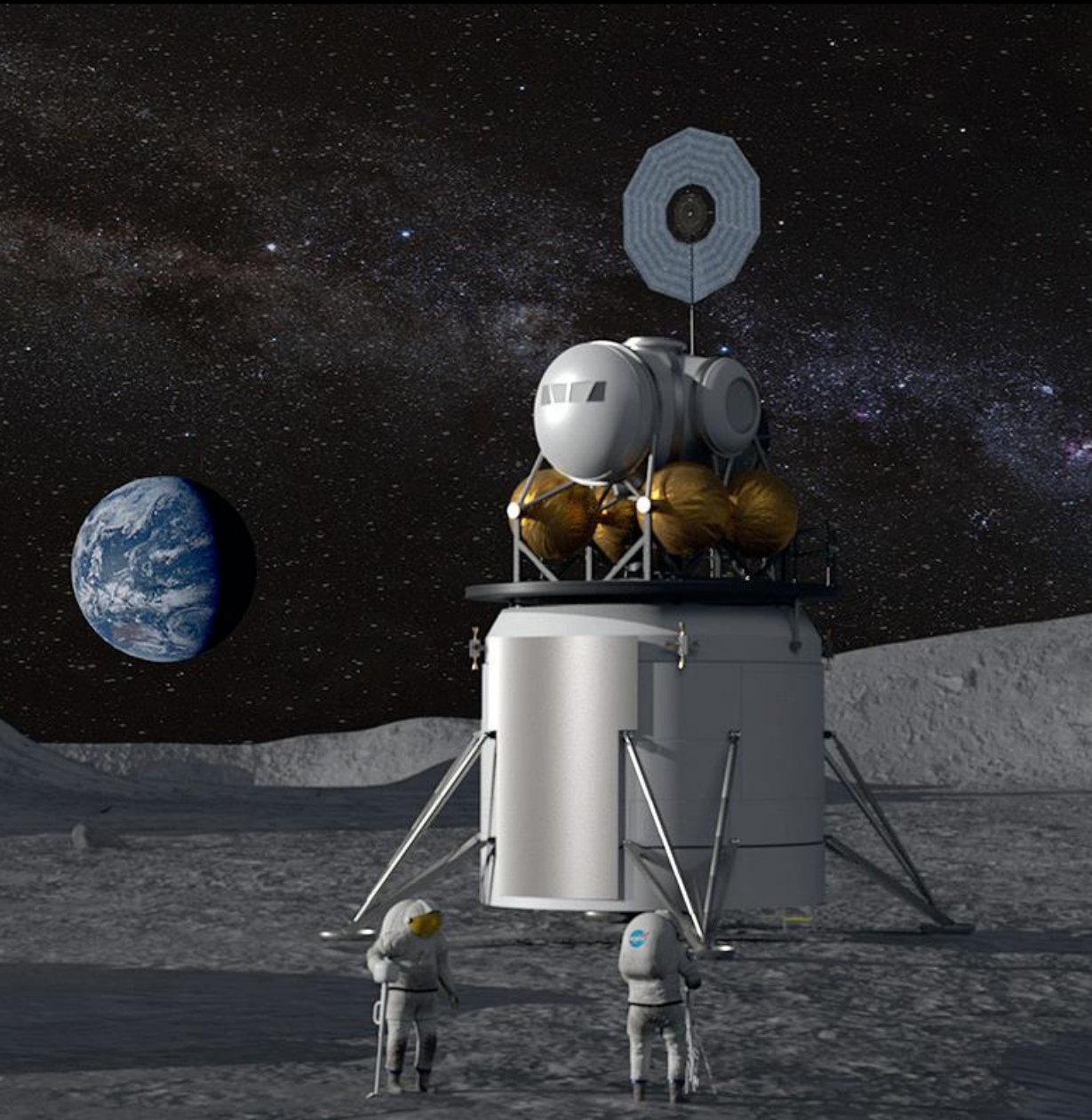


Now...





Next...



Digital Transformation

[**dij**-i-tl trans-fer-**mey**-shuhn] *noun*:

Employing digital technologies to change a process, product, or capability so dramatically that it's unrecognizable compared to its traditional form.

TRADITIONAL



DIGITIZED



TRANSFORMED

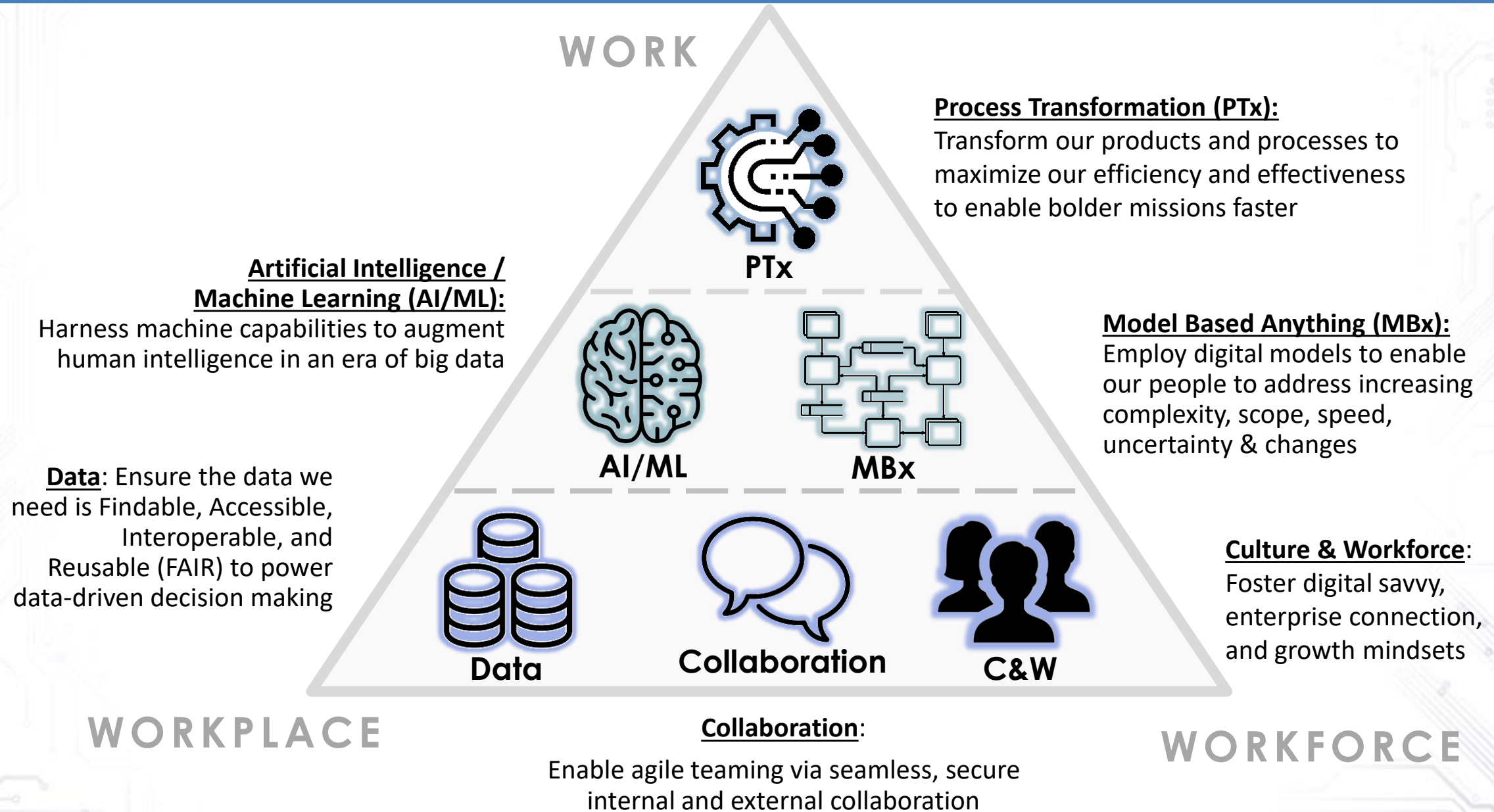


From Maps to Apps...

Digital Transformation
has already changed our world



Mobilize DT Foundational Elements

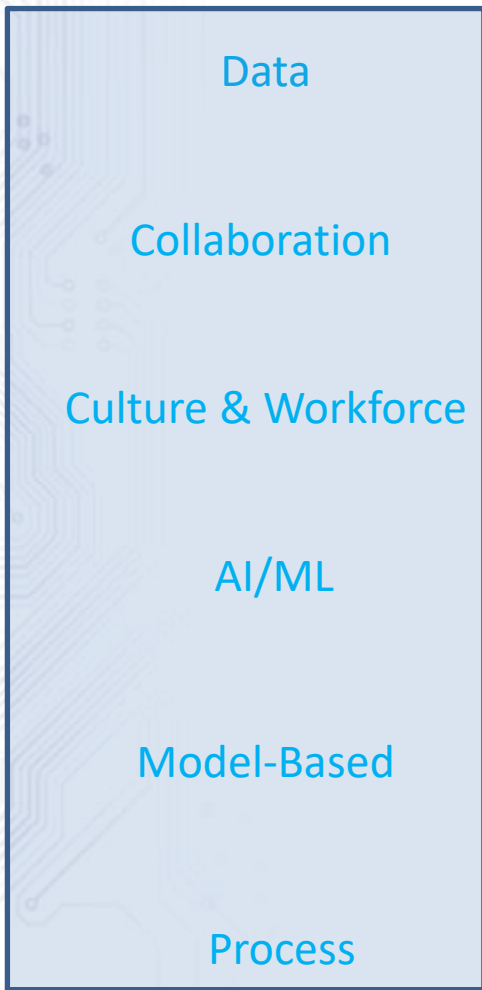


Digital Transformation Acceleration

***Denotes future opportunity*



Initial DT Foundational Elements



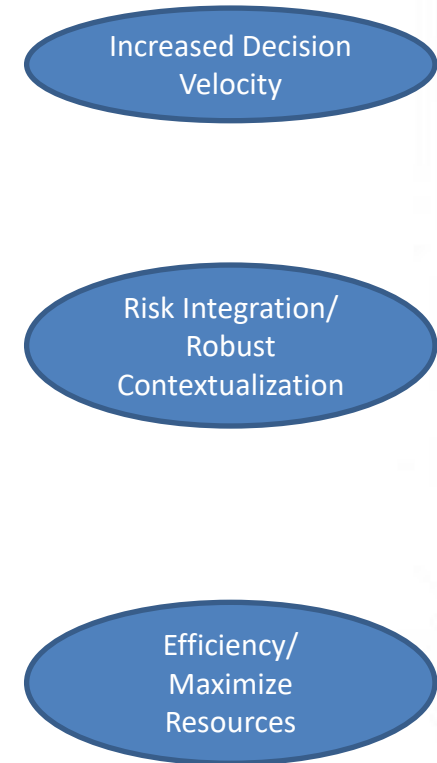
Evolving SMA/R&M Roadmap Elements



NASA Coalition Projects/ Agency Anchoring Points



Achieve Desired Goals & Outcomes



Align

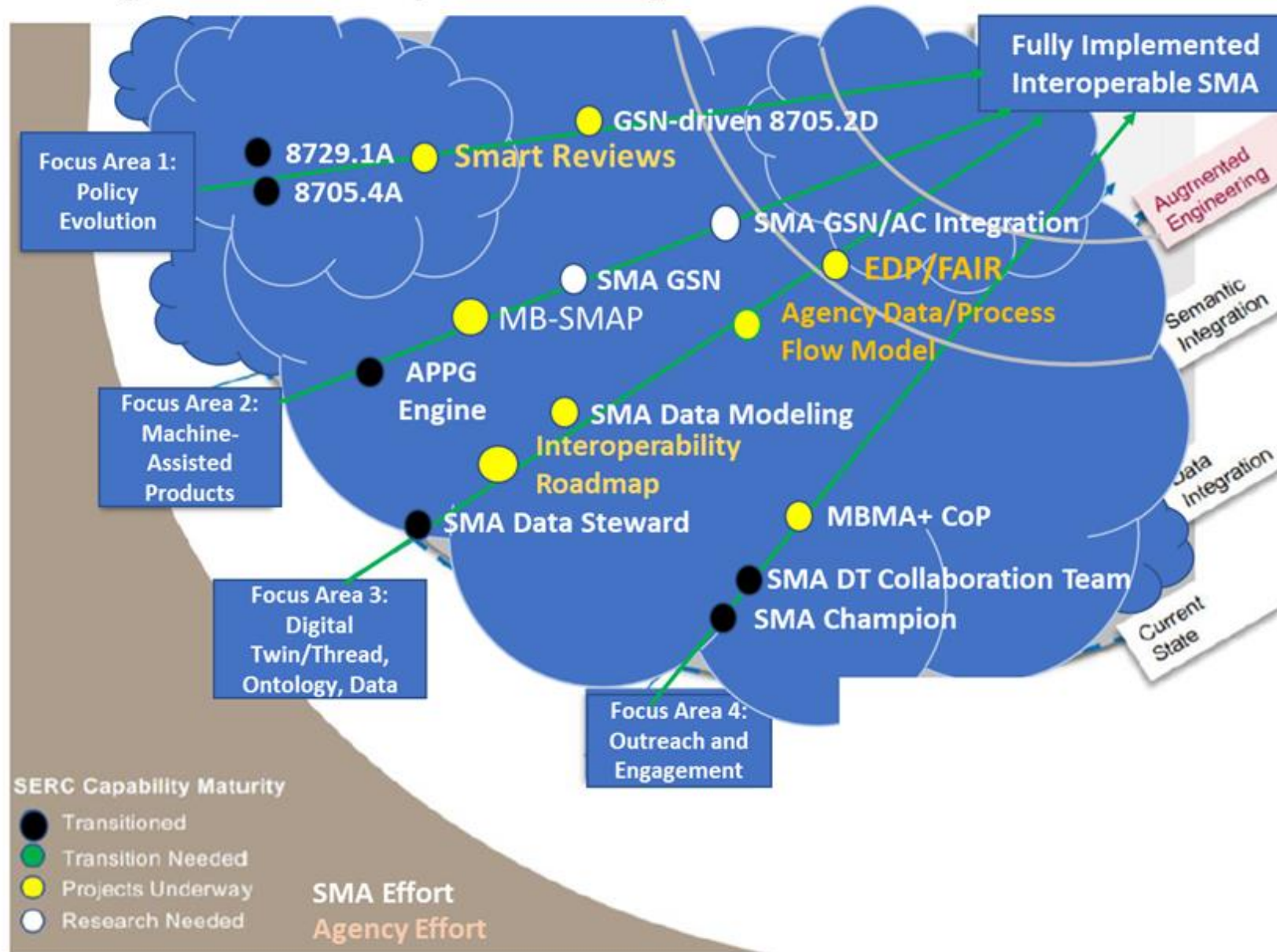
Leverage

Integrate

Engage

DT Strategies

Digital Roadmap for Safety and Mission Assurance



Adapted from Reference: Dr. Mary Bone, SERC

R&M DT Activities	Brief Description	Expected Benefits
Policy Evolution – GSN and Safety/Assurance Case framework	Use Goal Structure Notation and use of an Assurance Implementation Matrix to enable a Safety/Assurance Case framework across the life cycle.	<ul style="list-style-type: none"> - Enables digitization of goals and strategies and their decomposition into requirements and a Safety/ Assurance Case framework. - “Digitized” Knowledge enables re-use and eliminates “wheel re-invention when the wheel already works. - GSN/ Safety/ Assurance Case enables flexibility and innovation
Automated Program Plan Generator (APPG) Engine	Create authoritative “digitized” source of SMA related goals, objectives, and accepted stds (including framework to capture evolving innovative approaches to meet various goals and application needs)	<ul style="list-style-type: none"> - Rapid, machine-assisted, generation of SMA goals, strategies, and plans based on risk posture and project parameters. - Ability to measure and capture plan execution effectivity using “digital threads” connected with corresponding operational missions. - Data enable AI/ML suggestions
Physics of Failure (PoF) Framework	Framework enabling AI/ML infusion, digital threads between analysis products (i.e., FMEA), failure models, source data, etc., across life cycle applications	<ul style="list-style-type: none"> - More rapid generation of physics-based reliability analysis - Enable AI/ML infusion to improve reliability estimation and fidelity. - Lessens reliance on document-centric handbooks to generate baseline reliability predictions.

REACH

NEW

HEIGHTS



REVEAL

THE

UNKNOWN



BENEFIT

ALL

HUMANKIND



Thank you!





BACK-UP

Build DT Network

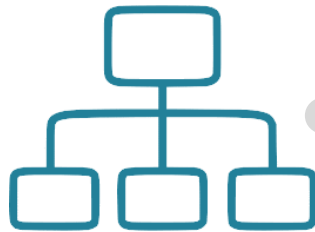
DT Users

NASA's employees, the ultimate internal customers of DT efforts, who play a critical role by being open to new ways of working and new opportunities created by the digital age



DT Champions

Senior Leaders from every NASA organization with authority and influence to adopt and align DT to enable organizational transformation goals



DT Steering Committee

Chaired by the **Associate Administrator** and advised by representative senior leaders to ensure Enterprise DT enables federal & NASA priorities to be responsive to the American public

DT Foundations Teams

Early Adopters from across NASA who follow DT trends and propose/explore DT applications to attack working level barriers to accomplishing high-value work



DT Partners

External Organizations who have a shared interest and co-invest in enabling our aerospace community to work seamlessly together at the global pace of 21st Century business



Define DT Strategy



1. Transform the way we **WORK**



2. Transform the experience of our **WORKFORCE**



3. Transform the agility of our **WORKPLACE**

Improve complex decision making

Make partnering easier

Speed delivery

Increase interdisciplinary innovation

Increase public & stakeholder engagement

Enhance employee engagement

Expand employee capabilities

Maximize employee productivity

Improve operational readiness & agility

Make teaming easier

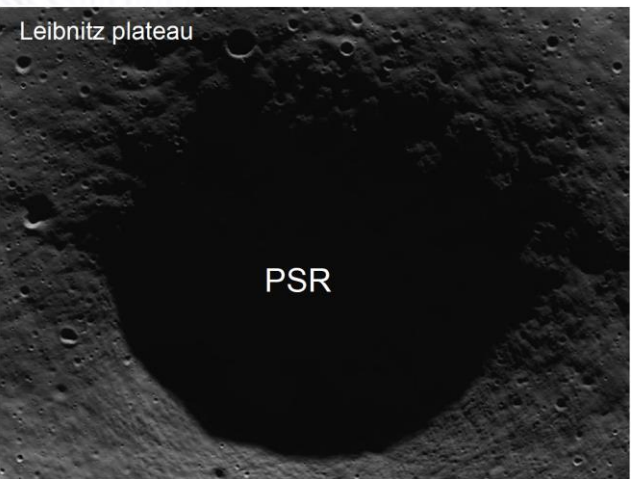
Rearchitect processes that work together

DT Coalition Approach

- **Conditions ripe for action:**
 - Orgs **already exploring digital solutions**
→ but constrained by **budget challenges**
 - **Limited visibility** into efforts across NASA
→ often **duplicate, fragmented and/or incompatible solutions**
- Decision to facilitate **Coalitions of the Willing:**
 - Identify **common challenges**
 - Co-invest in **shared solutions**
- **Benefits:**
 - Minimize disruption / resistance
 - Maximize engagement / solutions of interest

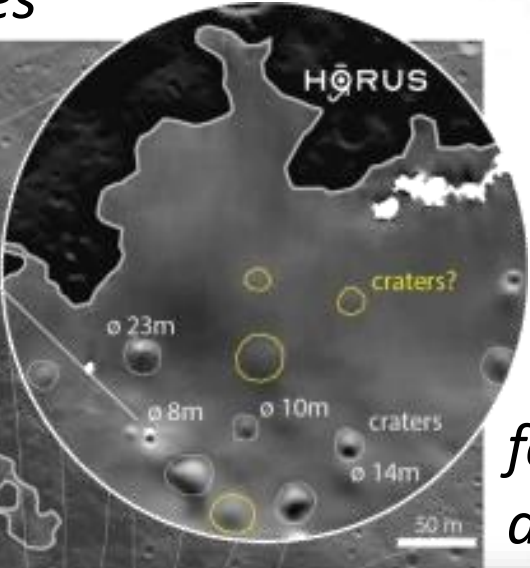
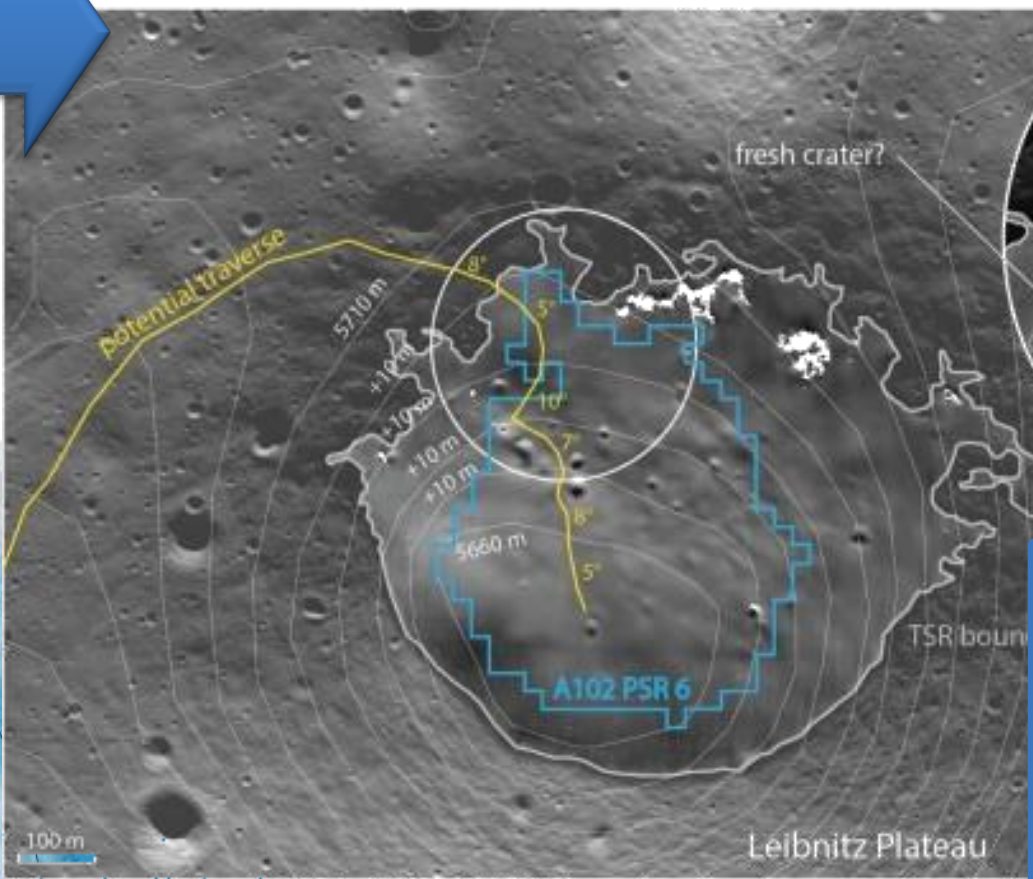
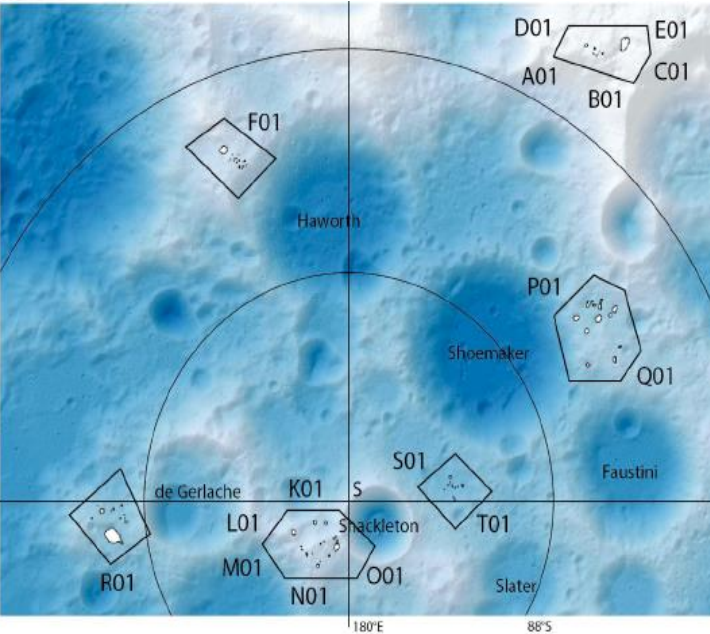


ML-powered Lunar Feature Detection



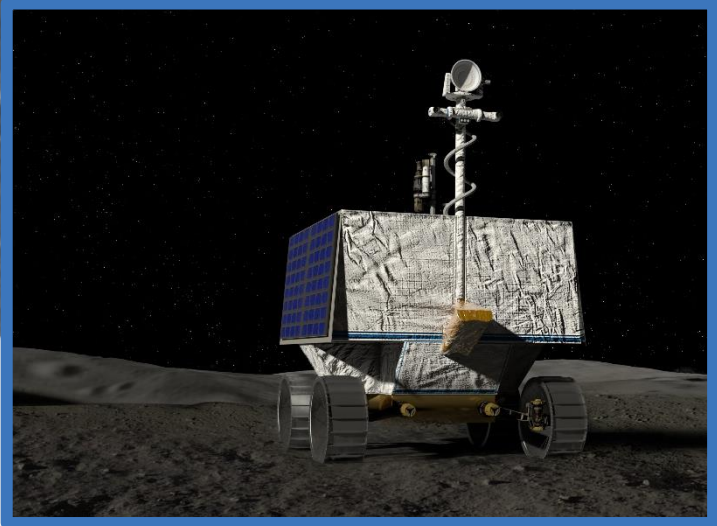
>4,000 high-res, low-noise images

22TB data



<3m feature detection

20 Landing Sites



Digital Academy & Swarm Innovation

Learning (SATERN) ▼

My Learning (SATERN)

Supervisor Toolkit

Skillsoft

HRBP Learning Library

Digital Academy

What is Digital Transformation?

NASA Digital Transformation



NASA's Digital Transformation dramatically enhances NASA's mission impact by reinventing mission and mission support processes, products, and capabilities enabled by an innovation culture, digital transformation, and enhanced digital

What is the Digital Academy?



What is Future of Work (FOW)?

Future of Work (FOW)



The future of work is ever evolving, but it is safe to say that for NASA that the future of work will have a hybrid work environment. The type of hybrid work environment

What is Model-Based Anything (...)

Model Based Anything (MBx)



Modernizing NASA through model-based processes and tools

Core Courses and Resources

MBx Foundation Courses

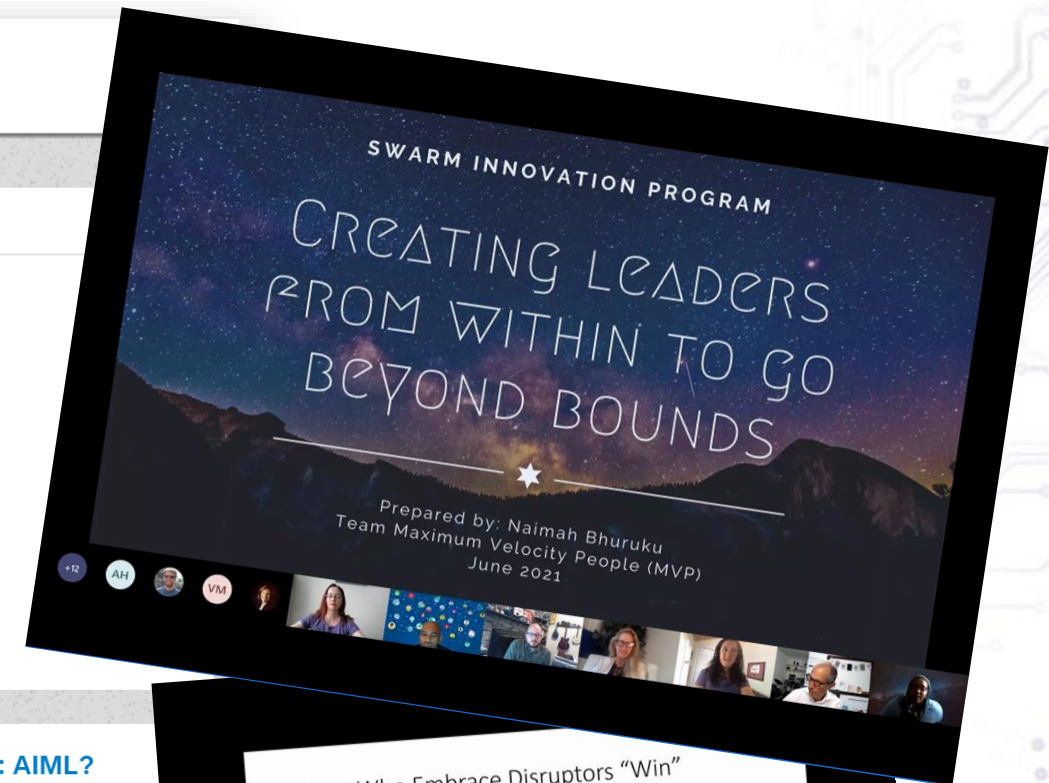
Foundations of MBSE

What is Data Science: AIML?

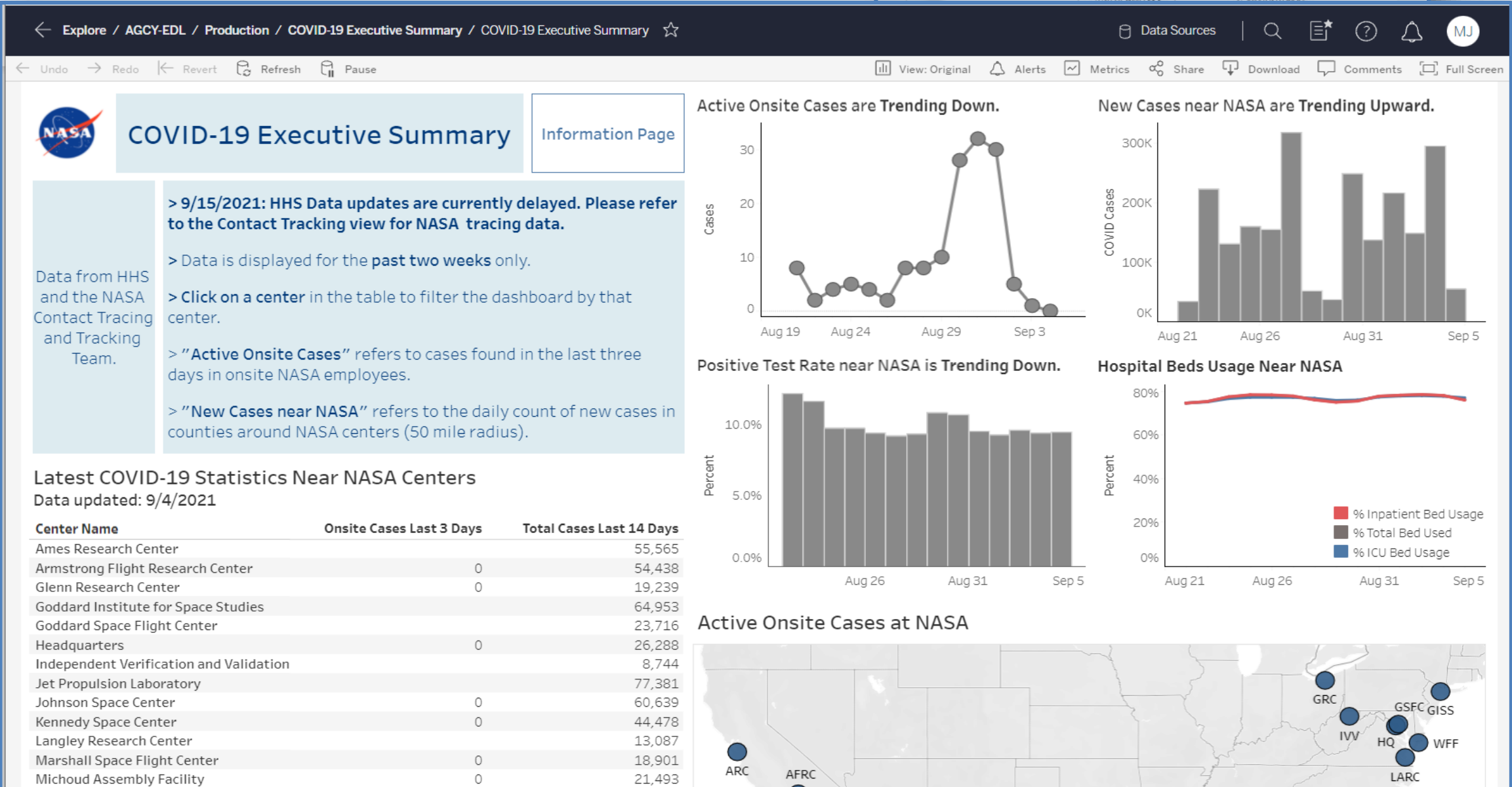
Data Science: Artificial Intelligence Machine Learning (AIML)



AIML Sharepoint

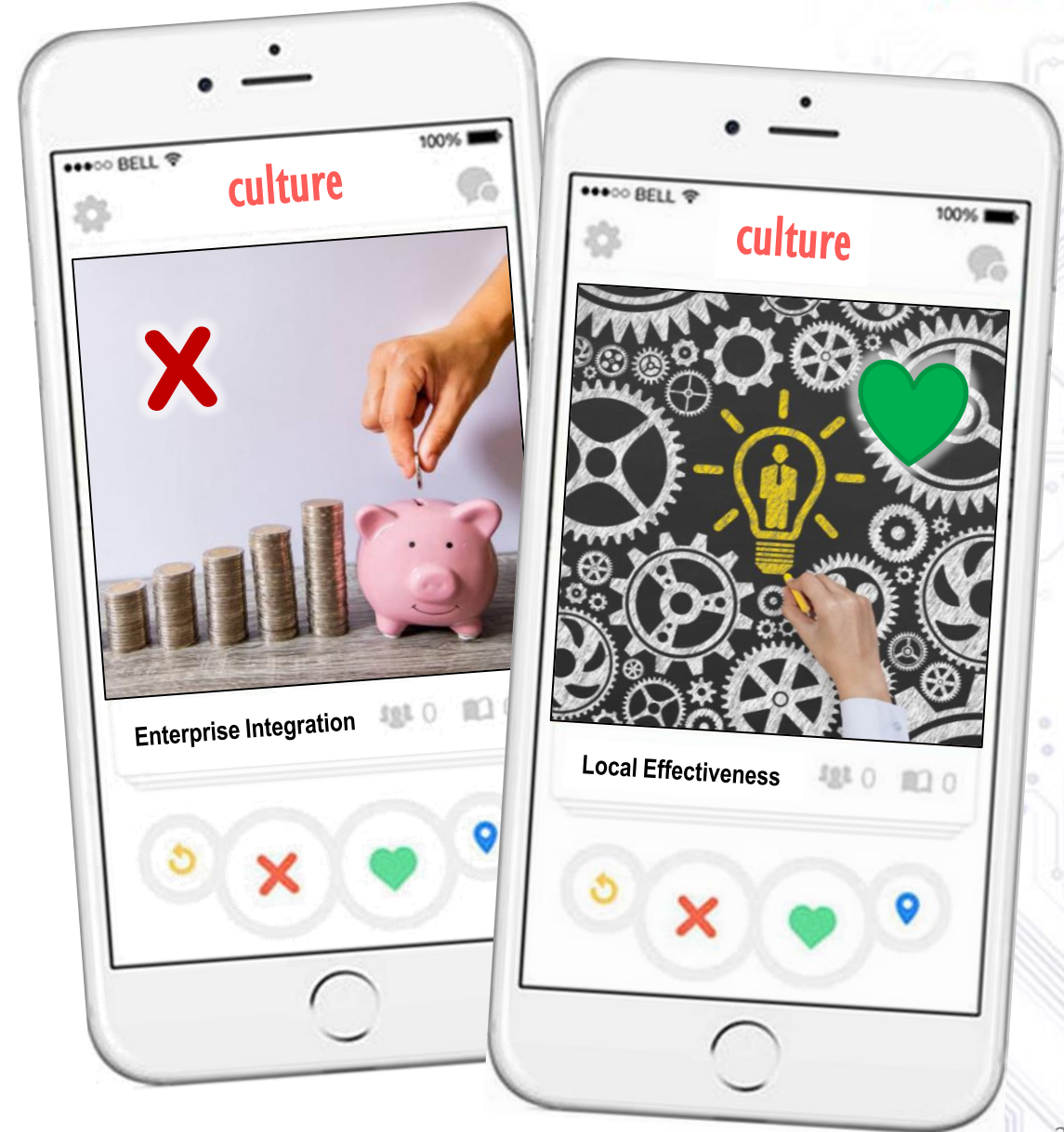


COVID-19 Decision Lens

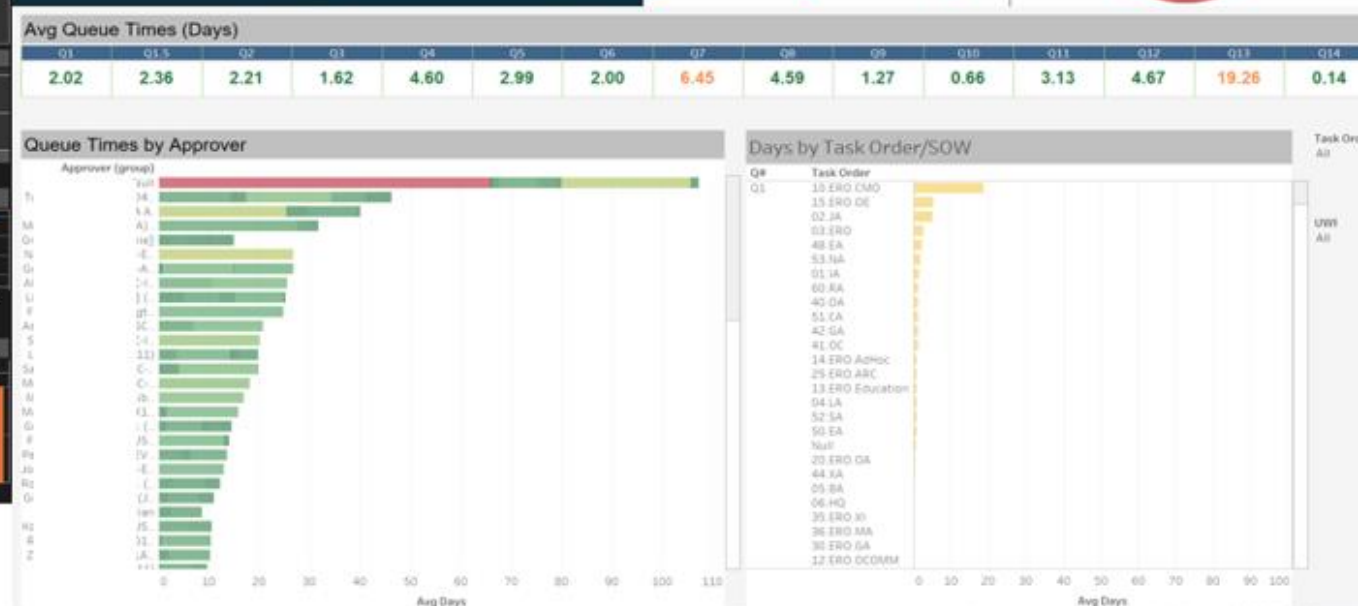
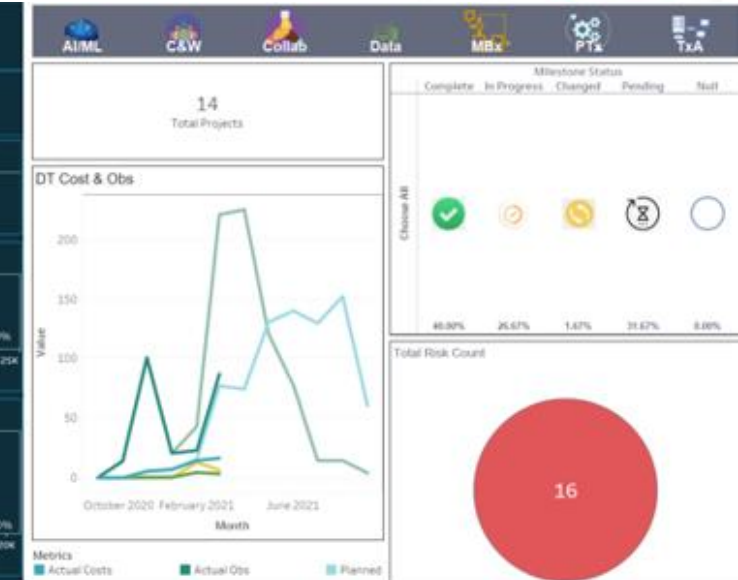
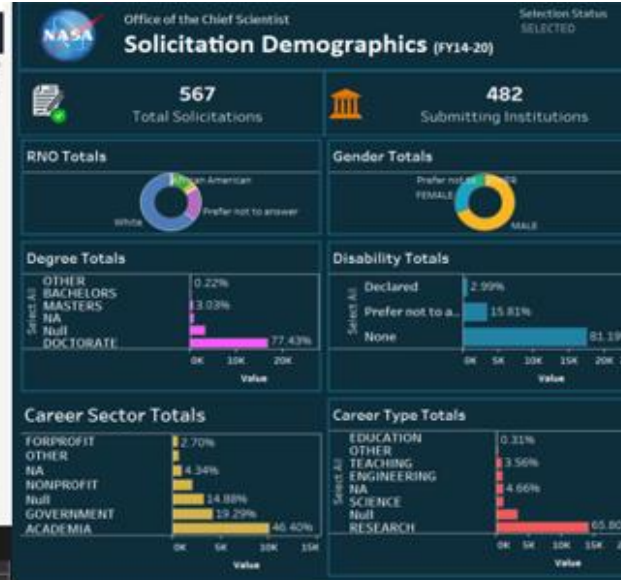
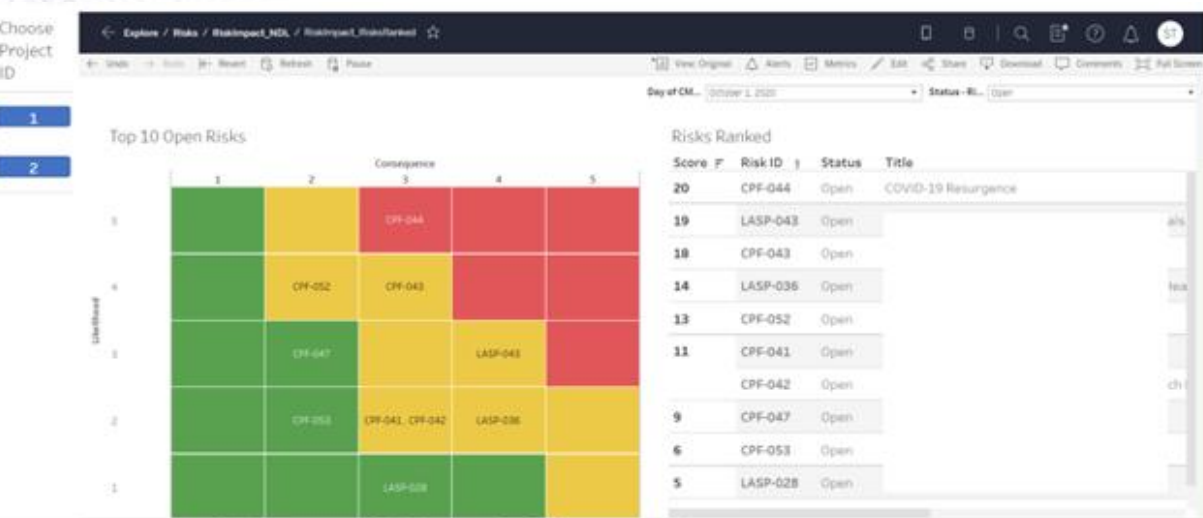


Forge DT Coalitions

- Some **cultural skepticism** on enterprise solutions & willingness to co-invest
- Rally senior leader Champions around the transformation vision → established consensus on **pace of delivery** as top transformation challenge
- **Human Centered Design** sprints to dissect 5 Mission sponsored aspirations where we need to move faster → worked with users to identify key delays & engaged solution providers to develop **minimum viable products (MVP)**
- Secured **50/50 matching** with orgs & Enterprise DT on key MVP projects



Transform our Data



Enterprise Data Platform

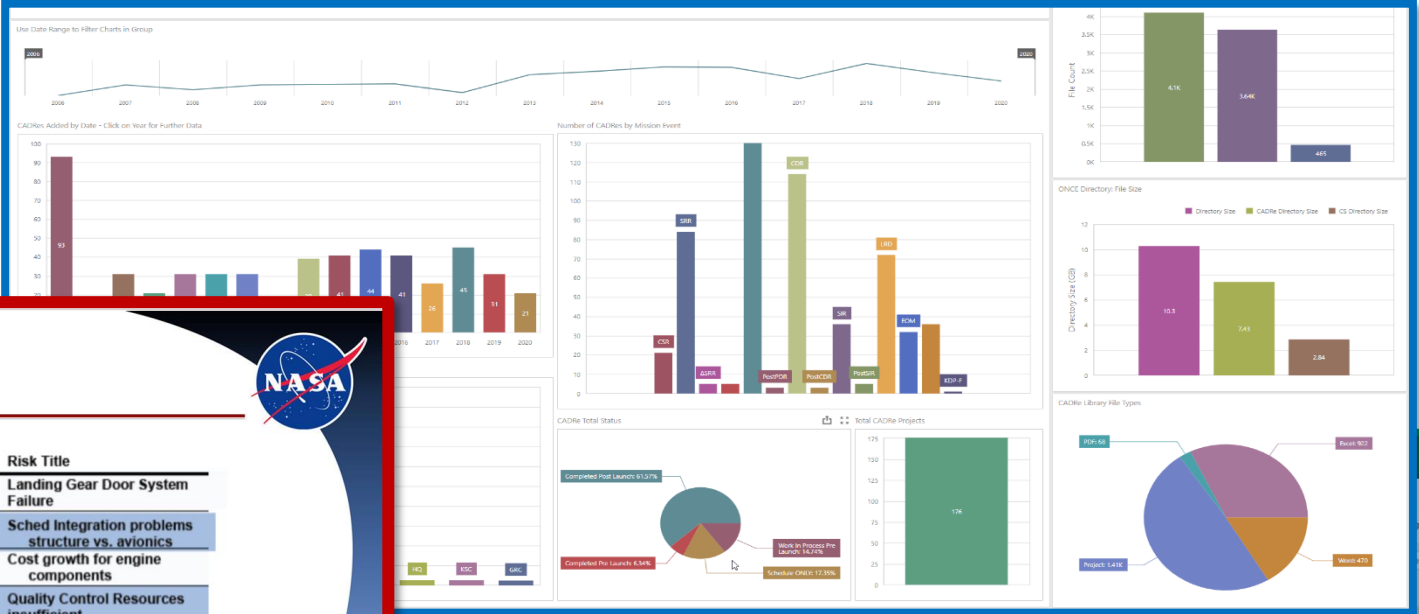
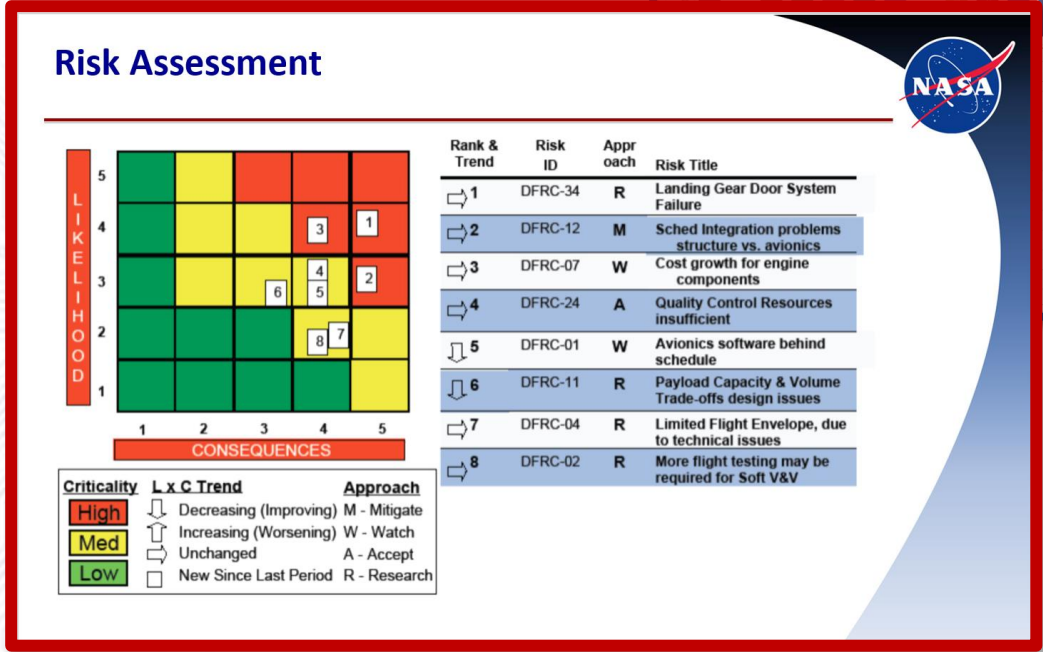
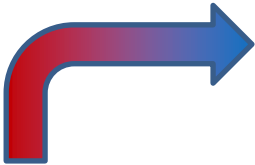
Transform our Engineering



Digital Engineering Environment

Transform our Reviews

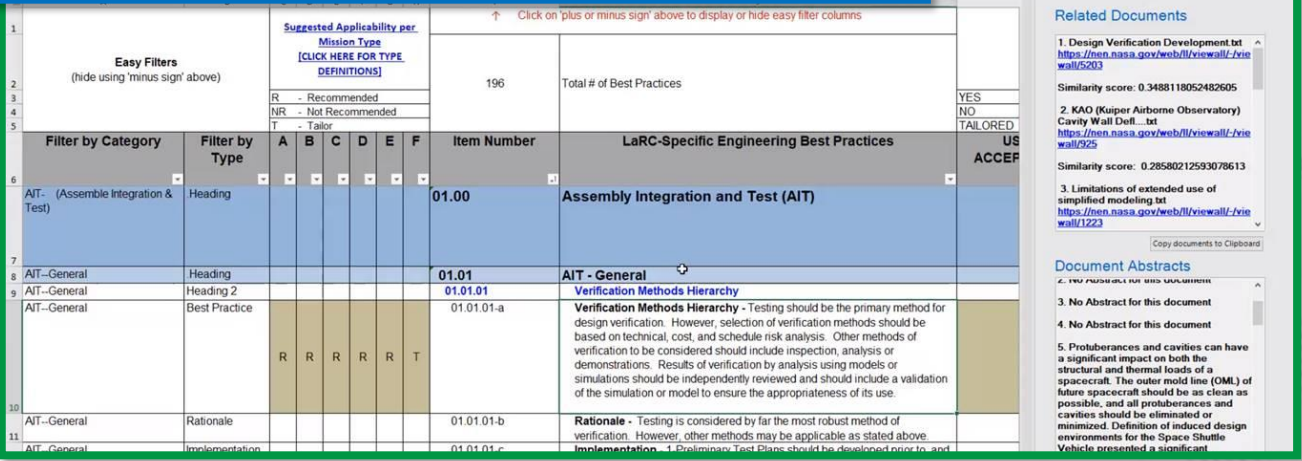
2D Charts



Live, drill-down Dashboards w/analytics



Smart Reviews



AI-powered PM Digital Assistants